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The social embedding of biomedicine: an analysis of German media debates 1995–2004

Peter Weingart, Christian Salzmann and Stefan Wörmann

Biomedical research and technologies such as cloning, stem cell research, and the deciphering of the human genome have met with opposition—albeit of different intensity—motivated by ethical values. The debates over the continuation of research and the implementation of the respective technologies are being staged in the mass media. The media have assumed the function of "embedding" controversial knowledge and technologies into society by using public discourse. The hypothesis is that these discourses follow a common pattern revealing the process of "embedding," and ultimately leading to a change of existing values. In this study, three debates over cloning, stem cell research and the Human Genome Project are analyzed in ten German daily and weekly newspapers over the period 1995–2004. It is shown that the patterns of reporting are more complex than anticipated. Rather than being identical for all technologies, they reveal different courses depending on the kind of knowledge/technology and value sensitivity.

Keywords: biomedicine, science and technology studies, media analysis, cloning, stem cell research, human genome project, social embedding.

1. The "embedding" of new knowledge and technologies through media debates

The public debates over new advances in biomedicine and options of their implementation reflect the complex process of "embedding" new knowledge and technologies in society. In particular cases where these options involve deep-seated values and ethical convictions—such as the dignity of the human embryo—these public debates are crucial for the success of the process of "embedding." By "embedding" we mean the process of the introduction of new knowledge and technologies and their subsequent adaptation to opposing values. The adaptation is mutual as both, technologies and values, change in the process. At the beginning of the process claims of scientists meet with both fears and enthusiasm on the part of the public expressed in the media. The crucial phase of the process, we believe, is the debate that is carried out to bring the often utopian visions and optimistic propaganda of the scientists in line with the fears and objections of the public as it is represented in and actively staged by the media. Only when that debate is more or less closed can one speak of a "normalization." The

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objective of our analysis, the results of which are to be reported below, was to identify the discursive mechanisms and argumentative resources which are employed when new knowledge and technology clash with societal values. We started with the hypothesis that in such cases debates follow a certain pattern: a first phase is characterized by far-reaching promises, even utopian visions of the implications of new research lines. These are met with value-bound resistance. The more utopian the promises, the more dystopian are the arguments in opposition to the new knowledge or technology. In a second phase of the debate, this value-bound resistance is gradually overcome as concrete research results are linked to individuals' interests. As we look here at three debates over biomedical knowledge, these interests pertain above all to health. Thus, strongly held general values such as the inviolateness of human nature are only upheld "as the moral barriers that they represent are technical barriers at the same time. Under the impact of new technologies the existing moral becomes outdated" (Van den Daele, 1985: 205). This process is complicated by the fact that we are dealing with different "morals" but also with different technologies (Van den Daele, 2000). Thus, the outcome may differ in the extent both to which values have changed and to which technologies have been adapted. The objective is to look at the patterns of interaction between scientific–technical innovation and existing values proper.

In mass democracies, this process takes place in public debates staged by and in the media. Here, the media have the function of a forum, reflecting broad public opinion as well as organizing it. They are the public arena in which social, ethical and legal aspects of the implementation of new technologies are debated (Neidhardt, 1993). Being independent entities the media operate according to their own criteria of relevance (Staab, 1990; Eilders, 1997). At the same time, they play a key role in legitimating political decisions, in particular by staging debates, i.e. the presentation of different positions and the provision of arguments (Gerhards et al., 1998). The legitimating function of the media is not restricted to politics but extends to science and technology as well. Value related resistance to certain research lines can undermine their legal and financial base and prevent further development (Gregory and Miller, 1998).

Given the centrality of the mass media in modern pluralist societies for staging public debates on controversial topics, such debates become an object of interest as an important mechanism of "embedding" new knowledge[1] into society. A whole series of studies has focused on the Human Genome Project (HGP), on "Dolly" and cloning as well as on other biomedical techniques. Even though they address different questions and proceed with different methodologies, many of their findings are relevant to our own. This is true even though these studies have been carried out in countries other than Germany. Some show very similar patterns, others reveal differences that can be explained with different values, legal conditions (cf. in the case of stem cell research) and political conditions. Nerlich et al. (2002) in their analysis of how the completion of the HGP was communicated to the public demonstrate the importance of value contexts and how scientists and policymakers play to them by using appropriate metaphors. However, similar patterns emerge with respect to the overall arguments either opposing or favoring the new technique: the "spectre of designer babies," although not explicitly mentioned in their material of British newspapers, "loomed large in the mid-market tabloid coverage," confronted by a "generally positive medical message" of curing major diseases and increasing life expectancy (Nerlich et al., 2002: 462). Analysis of reactions in the US (consumer telephone survey and media analysis) shows a very similar ambivalence to the new knowledge and sees it reflecting the same division into a "Discourse of Great Promise" and a "Discourse of Concern" that Durant, Hansen and Bauer had already observed in early focus groups (Tambor et al., 2002: 35; Durant et al., 1996). Human cloning, even though not mentioned in the press in connection with the HGP,

was nonetheless on the minds of respondents. According to the authors, this supports a remark by Francis Collins, head of the HGP, that people tend to "lump anything with 'gen' as the human genome project—gene therapy, GM foods, cloning—it's all the same thing" (cited in Tambor et al., 2002: 36).

The debate on cloning is still more sensitive, the fears associated with cloning reach deep, and they are connected to "mistrust in scientific endeavor, in the motives of scientists, and in existing systems of regulation and legislation" (Petersen, 2002: 73). Scientists emphasize the medical benefits of cloning, too, and the media frequently report about their optimistic views but especially in the case of cloning the climate of positive opinion is hard to sustain. After the announcement of Dolly, reporting in Australian papers, for instance, highlighted the dangers of human cloning and the need to regulate cloning research. "Stories 'framed' the issue largely in terms of risk and imminent threat" (Petersen, 2002: 85). The activities of pseudo-scientists such as Richard Seed and Brigitte Boiselier of the Raelian sect that claimed to have achieved or were just about to clone human babies and similar announcements of the credentialed American fertility experts Zavos and Antinori contributed to a cloning hype throughout 2001 that raised already existing anxieties to even higher levels (Nerlich and Clarke, 2003). All of these media events reveal both commonalities and differences. They are, furthermore, all examples of what we refer to as processes of "embedding" of new knowledge. The objective is to identify the patterns and mechanisms that create them.

Research into discourses on such diverse issues as nuclear energy (Gamson and Modigliani, 1989), abortion (Gerhards et al., 1998), the legalization of drugs (Weßler, 1999), and climate change (Weingart et al., 2002) allows a number of conclusions about the dynamics of such discourses.

- The issue in such discourses is not finding the better argument. Rather the discourse evolves under the operative conditions of the mass media.
- Arguments and their value references appear only in "bits and pieces" (Weßler, 1999: 70). Owing to permanent references to previous arguments, fragmentary statements can only be analyzed in the context of larger text corpora (Entman, 1993).
- In the case of subjects that present dilemmas, the discourse tends to become moralizing which makes the legitimation of (political) decisions more difficult.
- In any discourse, "fragmented bits of understanding reality" (Hajer, 1993: 41) come together and different arguments and positions may coalesce to a cluster which subsequently becomes the reference for all further arguments. These clusters assume the function of a *storyline* for a group of actors, together with adjoining problem definitions, attributions of causes and problem solutions. If there is discursive closure such a storyline can dominate so much that it is binding for the participants in the discourse (Weingart et al., 2002).
- Owing to the limited attention of the media and their audiences, symbols, metaphors and keywords, i.e. abbreviated representations of more complex interpretive patterns, have an important function.
- Only few communicated events provoke sufficient reactions from actors that, in turn, trigger counter reactions so that, for example, a "climate change discourse" evolves that remains stable over some time and serves as a news value for the media.

During the first half of the 1990s the leading German media paid increased attention to the topic of biomedicine (Kohring et al., 1999; Hampel et al., 1998).[2] With the deciphering of the human genome the volume of reporting in the media has increased even further. Not only are the medical and scientific implications (i.e. potential forms of therapy) being discussed but so

also are the social, ethical and legal aspects linked to them. Thus, in the case of stem cell research the issue of human dignity is discussed together with the issue of the freedom of research or the right to health.[3] The debate on embryonic stem cell research is carried out in the newspapers, above all the *Frankfurter Allgemeine Zeitung* (*FAZ*) with such intensity that the former president of the Max Planck Society was suspicious of a synchronized bioethical campaign of German daily newspapers (Markl, 2001).

Although this study focuses on the media debates only and leaves the political context aside, one remark is warranted. The intensity with which the debate on stem cell research was carried out in Germany is often explained with that country's particular sensitivity about its past. Indeed, recent developments of biomedical techniques clearly raise the specter of eugenics. A 1991 exhibition, not in Germany but in Paris, made the point already: "Today, astounding paradox, the generation following Nazism is giving the world the tools of eugenics beyond the wildest Hitlerian dreams" (M. Vaquin, cited in Kevles, 2000: 180). Albeit, at least to our knowledge not established by systematic empirical data but based on impressionistic perception of media coverage, it is highly probable that references to Nazi crimes in connection with eugenics are more frequent here than in the Anglo-Saxon countries and contribute to a heightened level of alarm in the German public with respect to potential abuses of biomedical techniques such as the use of embryos in stem cell research or cloning.

The multilayered quality of the debate is due to the fact that biomedicine cuts across a whole series of applications (Dolata, 1998: 144). This is exemplified in the area of molecular medicine. Embryos that are produced in artificial insemination and are not transferred into the uterus may be used as a basis for the production of human embryonic stem cells. The technique of artificial insemination is also a condition for preimplantation diagnosis (PID) which was clinically implemented successfully for the first time in 1990 (Handyside et al., 1990). The discussion about PID and other genetic tests is tightly linked to progress in the Human Genome Project which, in turn, is the basis for the discovery of genes causing diseases. In the discussion about stem cell research one finds references to the possibilities of therapeutic cloning, and since 1997 reproductive cloning—in the cloned sheep "Dolly"—is an important referent in the public debate on genetic engineering because it signals the possibility of the cloning of humans (Mieth, 1998; Kollek, 1998).

The debate on the different strands of biomedical research and technology has been until very recently the dominating public debate related to science and may therefore be taken as a paramount example of the "embedding" of new knowledge into society.

2. Scope and methodology of the study

The empirical base of the study is the reporting on biomedicine in ten daily and weekly German newspapers over the period between 1995 and 2004.[4] A *quantitative analysis* is based on a set of 26 keywords and clusters of keywords that could be searched electronically. With these data we have comprehensive information about media attention to biomedicine over the entire period and not just about the debates surrounding it.

A second part of the quantitative analysis differentiates the material on biomedicine and focuses on three debates: the cloned sheep "Dolly" (1997: 199 articles),[5] the Human Genome Project (2000: 360 articles), and stem cell research[6] (2001–2: 931 articles). Debates are communications that last for a certain time, are carried out in several media, and comprise a certain number of articles dealing with the same issue. Again, the curves gained from the number of articles on the respective issue that appeared day by day indicate the level of attention. They can be linked to specific events that explain particular peaks. The overall shape of the curves reveals

the course of "issue attention" over the duration of the entire debate. They were coded according to source, author, origin of author, date, title, section, topic and subtopic, and occasion.[7]

The *qualitative content analysis* (Mayring, 2000) focuses on a more detailed look at the debates. The reconstruction of the debates requires a *differential weighting* of articles. While mere reports are included, opinion pieces such as commentaries and lead articles are deemed more important. The chronological analysis of these articles serves to trace the course of the debate as well as the arguments and positions of diverse actors. The analysis is strictly chronological, done by two coders separately. Typical quotes were identified by both, then interpreted and followed by a subsequent analysis. The qualitative analysis was oriented by the following guiding questions:

- Which event triggers the reporting?
- Which actors are speaking?
- What share of the article is being taken by comments and what is their tenor?
- What are the central issues of conflict in the debate?
- What are the respective arguments on the "pro-" and "contra-" sides?
- Where is the boundary between the technically possible and the politically and ethically acceptable being drawn?

The methodology thus combines quantitative and qualitative content analysis. The thesis is that debates share a common pattern: the beginning of a debate is characterized by a general, ethically based resistance to the new knowledge/technology in question. Subsequently the conflict between ethical values and the new knowledge/technology is gradually resolved by referring it to detailed problems such as concrete forms of implementation. The ethical resistance is gradually overcome by appeals to piecemeal applications. The technology is not being rejected but, instead, the values are adapted to it.

3. Results

Quantitative analysis

A first overview shows that media attention for biomedicine has grown dramatically around the year 2000. Based on the occurrence of four keywords—biomedicine, stem cells, cloning, and Human Genome Project (with respective truncations)[8]—the curves show the increase of attention around 2000 (and the subsequent decrease) (Figure 1). The differences are also instructive. Stem cells and cloning attract most attention.

Cloning is a special case, however. It attracted media attention since the announcement of Dolly's birth in 1997.[9] But since then the metaphorical use of the term "cloning" has increased, i.e. it has been used in many other contexts which explains why it appears in many non-technical articles.

It is also notable that the intensity of media reporting is and remains higher in the case of stem cells and cloning than for the Human Genome Project. Generally, the news value of biomedicine has increased so that relatively small events have a higher probability of being reported.

In order to find debates, we looked at the frequency curve for five keywords—stem cell, cloning, bioethics, National Ethics Council (*Nationaler Ethikrat*, NER), and PID—in two-week intervals. Thus, peaks could be identified in clearly demarcated time spans.[10] These are taken to be debates. However, the frequency curves are only representations of the media career of a concept. The ultimate identification of a debate can only be achieved by analyzing

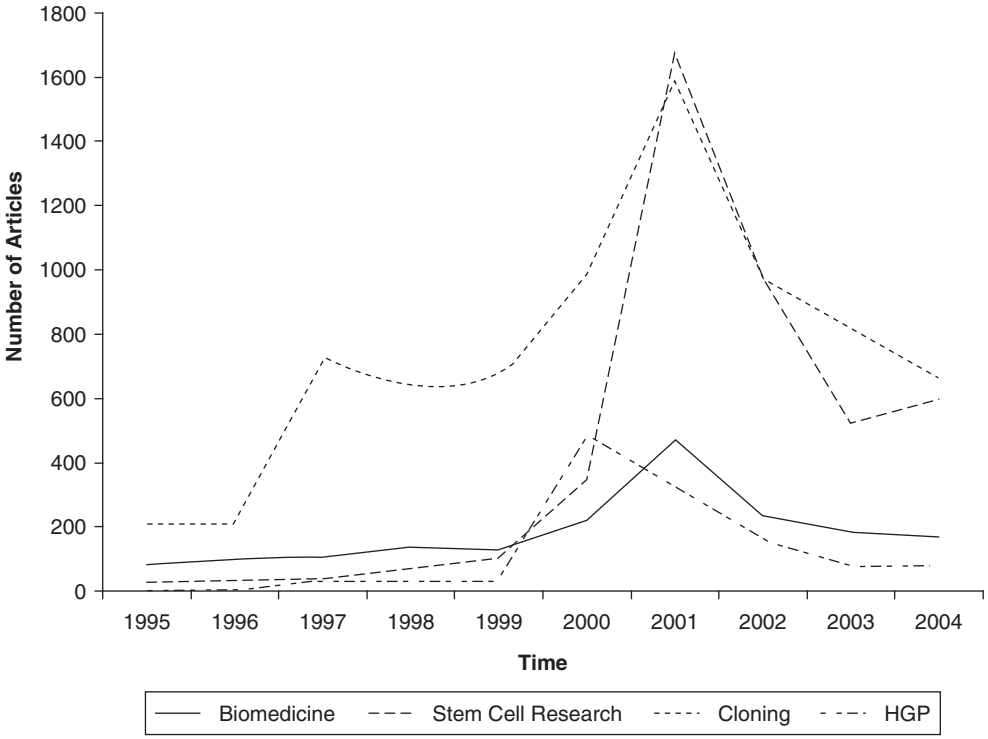


Figure 1. Media attention to biomedicine 1995–2004.

concrete articles. Three debates were thus identified: cloned sheep "Dolly" (24 February–12 June 1997),[11] the cracking of the human genome (3 April–31 December 2000),[12] and stem cell research (1998–2002 with the emphasis on the period 2001–2).[13] Obviously, the operational definition of a debate does not cover the actual extension of the debates on each of the three topics but is limited to the time period for which the intensified media reporting could be observed. Debates over cloning reach back at least to the late 1970s when the perspective of cloning moved closer by the advances of molecular biology triggering fictitious reports of the successful cloning of humans (Rorvik, 1978). The same is true for the Human Genome Project albeit not in that particular form. But visions of the identification of specific genes and their functions date back to Mendel's discovery of heredity although the obstacles seemed insurmountable. Resistance to applications of respective techniques has been provided by many authors even before their concrete availability (e.g. Etzioni, 1973). These precursors to the much more recent debates reflected in our media coverage will go unmentioned in this analysis even though some aspects of the pattern we are looking for—such as the initial utopian promises and dystopian opposition—may actually have taken place then. This must be kept in mind when interpreting the patterns of the attention cycles presented below.

The quantitative data about the three debates show quite different patterns. The "cloning debate" follows the somewhat expected course (Figure 2). The initial peak reflecting the presentation to the press of "Dolly," the cloned sheep, is followed by a series of ever smaller peaks related to different political events, the first of which is a unanimous vote by the

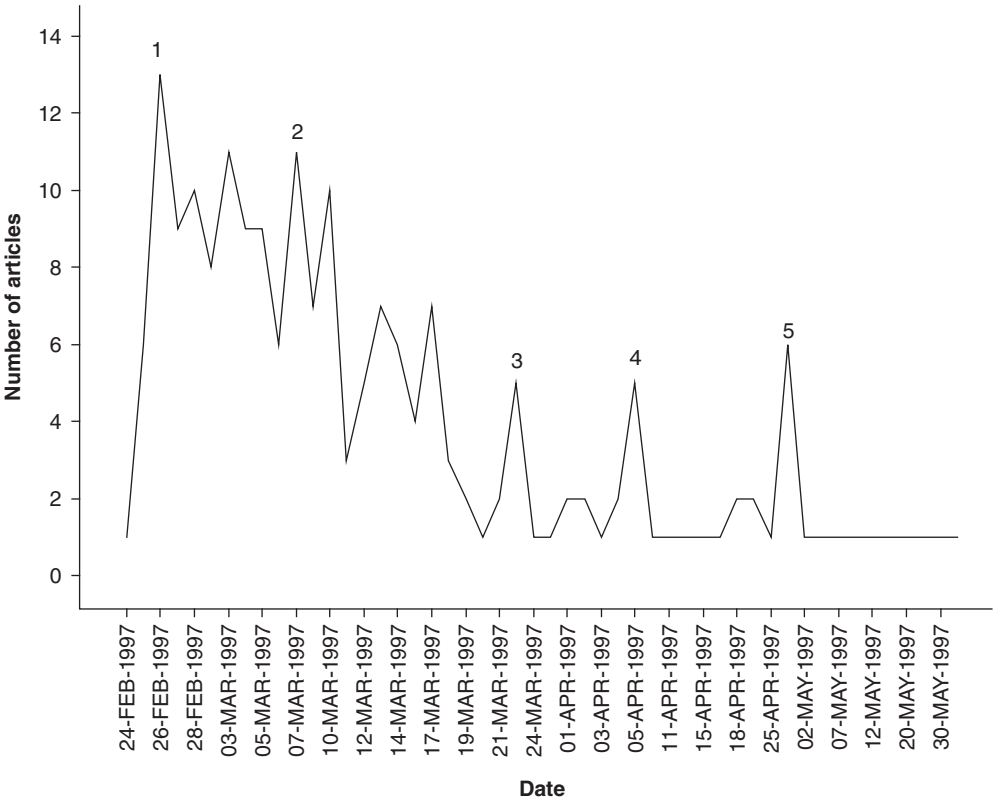
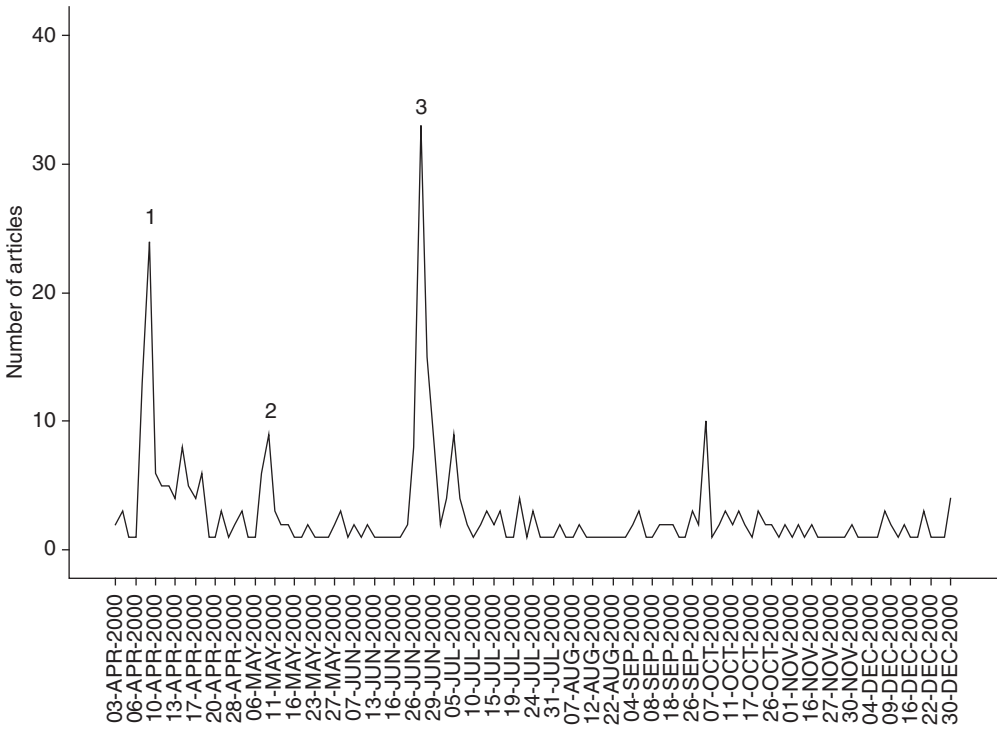


Figure 2. Debate over cloning.

German parliament, the Bundestag, banning the cloning of humans. With this the debate is practically over as the consensus against cloning is nearly complete. A closer look shows that a few voices wanted to keep open the option of therapeutic cloning which may signal a future revival of the debate and the embedding of cloning on the health ticket.

The "human genome project" debate reveals a quite different pattern (Figure 3). One peak at the beginning in April 2000 was triggered by Craig Venter's press announcement that he had already cracked the code. This attracted media attention not because the technology raised moral opposition but because the competition between publicly funded and private research was at issue. The second and only other significant peak in June 2000 was caused by the press conference of Bill Clinton and Tony Blair where the two statesmen declared all data from the project to be made publicly accessible. If there was an ethical issue, it pertained to the opposition against the commercialization of the human genome data, i.e. a regulatory issue.

The debate over "stem cell research" shows yet another pattern (Figure 4). Triggered by the declaration of the German science funding agency (DFG) that it wanted to import stem cells, the subsequent debate is characterized by a series of peaks that indicates a relatively



1 Venter's press release, that he had decoded 99% of the human genome
2 Decoding of the chromosome 21 in Germany
3 6-26: Press conference with Bill Clinton and Tony Blair 6-27:
FAZ print part of the code of the X chromosome 6-29: Main theme in DIE ZEIT

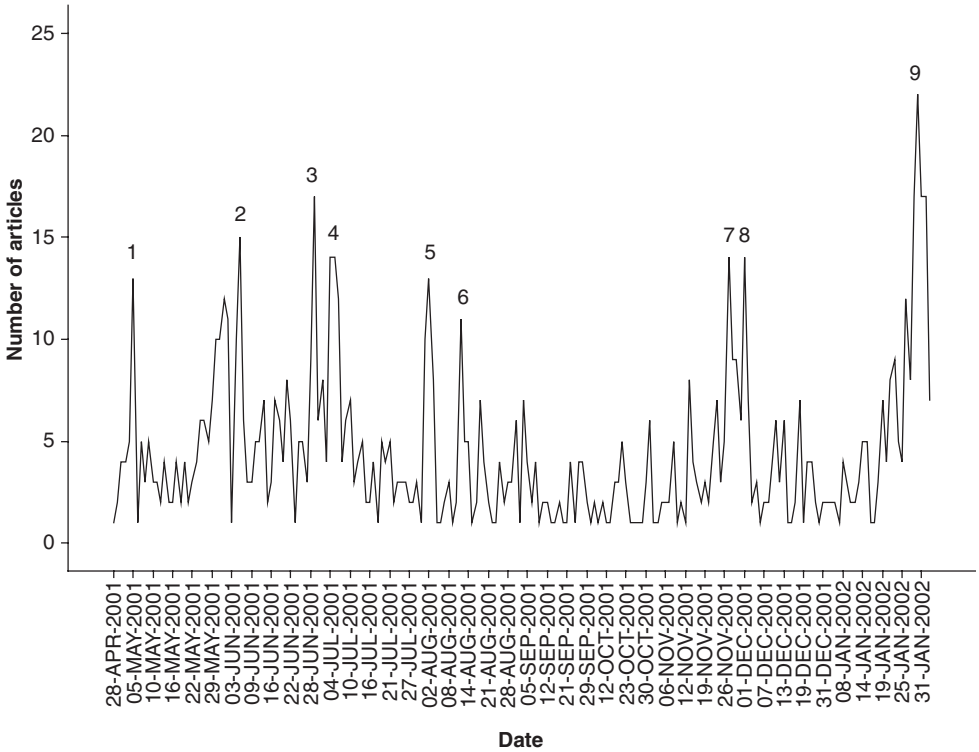
Figure 3. Debate over the HGP.

high level of media attention over the entire length of the debate. It ends with the decision of the German Bundestag at the end of January 2002 to ban the production of new cell lines and to allow research with imported cell lines only. This shows that the entire debate was closely linked to that particular decision and depended on its outcome.

Qualitative analysis

The debates were then analyzed according to the guiding questions (cf. above) in order to identify common patterns and differences.

Cloning On 23 February 1997, the British scientist Ian Wilmut announced the first mammal cloned from a differentiated cell. With this innovation the conviction that no new life could be created from differentiated cells was refuted. Wilmut's presentation of Dolly initiated the media debate in 1997. Already the first report in the tabloid *Bild* made reference to the cloning of humans which subsequently became the horror scenario around which the entire debate developed. The cloning debate is special in the sense that the utopian vision of cloning is actually a dystopia in the eyes of virtually every participant in the debate.



1 DFG recommendation
2 Clement visits Israel and debate on principles of the German Bundestag about genetic engineering
3 Did the University of Kiel request embryonic stem cells from Australia?
4 Stem cells in Munich and Cologne and suspension of decision on stem cell
5 no special event
6 US-decision and statement of President Bush
7 Embryo cloned by a US-company
8 Statement of the NER
9 Decision of the German Bundestag

Figure 4. Debate over stem cell research.

> Science has moved closer to the dream of the reproduction of life.
>
> A NIGHTMARE! (*Bild*, 24 February 1997)
>
> The birth of the sheep Dolly is a beacon like the first nuclear explosion. The cloned human must not be. (*Handelsblatt*, 27 February 1997, p. 2)
>
> "Now everything is doable". With the appearance of the cloned sheep "Dolly" a dam seems broken: Identical copies also of humans will be producible in whatever numbers. (*Der Spiegel*, 10/1997 (3 March 1997), p. 216)

Wilmut himself admitted that the possibility of cloning humans had become real and called for "unequivocal laws" to prevent this (*Der Spiegel*, 10/1997 (3 March 1997), p. 220). In fact, his achievement opened the door to high-tech eugenics. Thus, one option would have been that cloning would be launched with a utopian eugenic perspective.

Instead, the rejection of cloning humans was unanimous. The common reason was that cloning conflicts with human dignity and individuality. Fewer are the visions that cloning would have negative consequences for society if only the good, beautiful and rich would be cloned. These social dystopias are nearly always linked to the breaking of a taboo. If this happened, thus the argument, such a development would end with Huxley's *Brave New World*.

> The chimera of a terrible creature is loose, as disgusting as Frankenstein's monster and as threatening as Godzilla: human clones, we have learned, could be created within two years. This vision is dreadful for everyone. (*FAZ*, 11 April 1997, p. 35)

There are very few proponents of the technology, and they do not propagate cloning humans. Rather they argue against an absolute ban on cloning because it would close the door to therapeutic cloning with its many options for curing diseases. This reference to medical applications of cloning and the journalists' doubts about the possibility to stabilize an absolute ban over time already signal in which direction one can expect the embedding of therapeutic cloning to go.

> The public reacts to "Dolly" with moral nightmares. All of a sudden the breeding fantasies return that belonged to the literature of the 19th and early 20th centuries: the double, the homunculus, machine man—it is as if concern with this freaking zoo had only been delayed … In Scotland is a sheep. It is supposed to produce proteins, maybe also milk, meat and wool. But the talk is about humans.
>
> In medicine moral imagination comes into trouble. The fantasies lose part of their threatening nature when the curing or even only the containment of diseases is at issue. (*FAZ*, 27 February 1997, p. 39)
>
> All false alarm? No one thinks about cloning humans? We should not be appeased too easily. As so often there could be "appliers" who propagate the doable so long until we take it to be the desirable—and indispensable to secure the economic position! (*SZ*, 26 February 1997, p. 4)

The rejection of cloning is accompanied by comments from journalists that the new technique will ultimately be realized against resistance, be it by mad scientists and/or totalitarian states. *Der Spiegel* commented that the ban on cloning humans will not be easily upheld in view of therapeutic reproductive applications in the case of female infertility, and that researchers had already prepared the ideological terrain for "man to measure" by postulating the power of the gene (*Der Spiegel*, 10/1997 (3 March 1997), p. 222).

> *Der Spiegel*: There is great fear that the technique will be abused.
> Wilmut: This fear is completely justified. We have said from the beginning: With our technique we can produce genetic copies of humans. Only unequivocal laws can prevent that.
>
> (*Der Spiegel*, 10/1997 (3 March 1997), p. 220)
>
> A worldwide proscription of the cloning of humans will hardly be reached. There are too many potential clients who are fascinated by the idea and who would pay substantial sums for a clone. (*SZ*, 30 April 1997, p. 4)
>
> "It will not be possible to stop cloning", declares US-biologist Lee Silver. "Now, everything is doable, all limitations have collapsed." (*Der Spiegel*, 10/1997 (3 March 1997), p. 219)
>
> The question of all questions reads: will legal barriers that are porous anyway hold permanently? Will society and its concept of the permissible … not change so much in the

> next one to two decades that, for example, the "law protecting embryos" of 1990 will not seem "up to date" anymore? (*FAZ*, 26 February 1997, p. 1)

Human Genome Project The debate over the decoding of the human genome differs from the others because as a scientific achievement it was hailed more or less unanimously. The beginning of the debate was not the press conference at which the final success was announced. Instead it began already in early 2000 with hints from Craig Venter that his company had decoded 99 percent of the human genome. Subsequently, four issues were discussed: 1) To what extent is Venter's assertion credible, and what is the quality of his data? 2) To what extent may parts of the human genome be patented? 3) What are the implications of the competition between public and privately funded science? 4) In connection to gene chips and genetic screening: how is one to deal with knowledge about one's genes vis-a-vis insurance companies and employers?

At the press conference of 26 June 2000, Bill Clinton and Tony Blair announced the end of the race between public and private research for the genome and promised future collaboration. Subsequently, the question of how to deal with the new knowledge moved to the foreground. Many authors called for an ethical research that would make it possible to identify and to react to problems created by this new knowledge as early as possible.

Two aspects were the focus of the debate throughout. Critics of the new knowledge warned of a new eugenics that would spread in reaction to individual demand. In due course this would lead to pressure on individuals with a genetic defect who would have to justify themselves for their condition. At the same time, the danger is cited that knowledge about the genome will feed the readiness to intervene into the human gene pool.[14] This scenario is regarded as the breach of an ethical barrier and represents the dystopia.

> Unfortunately we have prepared an entire generation of children for a new eugenic era by having indoctrinated them: You are your genes. (Jeremy Rifkin in an interview in *SZ*, 9 August 2000, p. 15)

> For the time being the barrier against cloning of humans and interventions into the germ line holds—but there are already noisy protests against the latter. (Jens Reich in *Die Zeit*, 27/2000 (29 June 2000), p. 1)

> Once God's image, now gene-construct … Only extreme control and discipline could prevent that people would be discriminated because of their genome. (*Die Welt*, 8 April 2000, p. 10)

Those in favor argue that the new knowledge about the genome will lead to entirely new therapeutic possibilities, above all individualized medications.

> We see the day coming that therapies like radiation and chemotherapy with their treacherous side effects and uncertainties will be medical anachronisms. This day will not be tomorrow or next year. And it cannot be brought about by one person, firm or organization. The revolution needs more than one soldier. (Craig Venter in *FAZ*, 8 April 2000, p. 43)

Again, the emphasis is on individual health interests being served by the new knowledge rather than collective measures that are the core of the dystopian images painted by the critics.

Stem cell research The crucial phase of the debate over stem cell research lasted from 4 May 2001 to 2 February 2002, in spite of the fact that the technology to multiply and cultivate stem cells had been available since the fall of 1998. Before the crucial phase of the debate began, the media had discussed at a relatively low volume various problems related to

stem cells. The positive and critical arguments that had been offered during that time did not change essentially in their structure in the crucial phase starting May 2001. This phase was initiated by a declaration of the German Science Foundation (DFG) calling upon legislators to "allow the import of pluripotent stem cell lines produced abroad" (DFG, 2001). The central issue of the debate that followed was if research on embryonic stem cells was to be permitted. Linked to that issue was the question whether they could be produced for research or if they could at least be imported.

The critics of stem cell research argued unanimously that the human embryo had a moral status and, thus, must not be "produced" only to be used and discarded later. Human life began with the fusion of egg and sperm cell, thus, research on embryos was not permissible.

> "The freedom of research is not without limits". Herta Däubler-Gmelin says, no embryo may be sacrificed for vague future visions of cure. (interview with the minister of justice, *SZ*, 12 May 2001, p. 8)

The proponents use a diverse array of arguments. One line appeals to economic reasons: to prevent stem cell research would jeopardize Germany's position in the globalized economy. Another strategy is to refer to existing regulations and practice with regard to abortion and other techniques of reproductive medicine. The main line of argumentation, however, is once again the appeal to health interests. A possible revolution in medicine is promised however cautiously. Once stem cell research achieved maturity, individualized therapy of organs would be feasible.

> Because stem cells are flexible, brain, kidney and heart cells could be grown from them and used for the repair of damaged organs. Maybe no patient would have to die while being on a waiting list for donor organs. (*FAZ*, 24 January 2001, p. 11)

4. Discussion

The comparison between the three debates shows a number of both commonalities and differences. Biomedical research is news for the media. Media attention to biomedicine has intensified, and so have the debates over particular aspects of biomedical techniques.[15] (This must be seen in perspective, however. The share of science related articles is relatively small, *c*. 5 percent, and that of medicine related ones is even smaller (Kohring, 2005).) Most of the attention is paid to cloning and to stem cell research, a finding that is supported by the parallel analysis of biomedicine in television news (Ruhrmann and Milde, 2006). The reason lies most likely in the controversial nature of these two technologies.

The debates all focus on conflicts between new knowledge and institutionalized ethical values, but nevertheless the foci differ. Not in all cases was the announcement of new knowledge or a new technology the actual reason for the beginning of the debate. The stem cell debate in the media was triggered by the DFG announcement about the import of stem cells. Although the promises of medical applications appear to be fairly concrete, the ethical opposition was based on an even more concrete violation of the principle of human inviolability backed, in the German case, by existing legal provisions. This explains why the debate was more intense than the other two were.

In the case of the HGP, the actual issue of contention was the "patentability of life" that seemed to arouse opposition, and became an issue in the media because it was Craig Venter representing private business who claimed to have completed the deciphering of the code. A fear connected to this is the vision of the "gene chip" that would violate the solidarity principle and

the right to self determination. The utopian scenario of a "eugenics from below" is ambivalent. Promises of an individualized medicine, fine-tuned to the genetic make-up of the patient, are countered by fears that illness will become biological fate and force the unfortunate ones to justify their condition.[16] The HGP clearly triggers fewer ethical concerns than the two other technologies so that the medical promises connected with it seem to be more convincing.

The "Dolly" debate is over the future implications of cloning. In this case the utopian vision of the cloning of humans is quickly turned into a dystopia.[17] Arguments in defense of the technique that point to the potential applications for the cure of inheritable diseases are rare. The horror of the duplication of humans and the loss of human dignity is (still) greater than the distant and uncertain promises of the cures through therapeutic, let alone germinal cloning. It may be speculated that the cloning debate is still in its early stages.

The number and origin of actors participating is quite different from debate to debate. It reflects not only the interests involved but also, to an extent, the publics that are involved as well as the scope of their involvement.

In the debate over stem cell research a greater number of scientists and policymakers was involved while only few representatives from the church and other social organizations could position themselves. The debate over "Dolly," on the other hand, is shaped primarily by policymakers, and only few scientists took part. The great number of scientists taking part in the stem cell debate may be responsible for the fact that media reporting in this debate is very even-handed. One indicator of the state of the debate is statements in the media about the expected social reactions to the knowledge or technology in question. These speculations point to the mechanisms by which the opposition will eventually be overcome, and in what ways the values will change. The "slippery-slope" argument typically accompanies all controversial technologies and already signifies the possible breakdown of the values that stand in their way. It is the argument that characterizes an early phase in the embedding of new knowledge and technology when the utopian/dystopian dichotomy is still the line of conflict. When the debate has moved to more detailed and concrete issues, the "slippery-slope" rhetoric is no longer appropriate. Then, questions of regulation become dominant. This does not mean that consensus has already been reached. In fact, the more pressing the need for regulation is perceived, the more concrete the arguments are against the research or technology. It is in this phase that the process of value change actually takes place. This would also agree with the analysis of biomedicine in television news where the shift of actors from scientists to policymakers and ethicists as well as a shift from benefit to more risk-oriented reporting seem to indicate an increasing politicization and a growing concern about the risks of the new techniques (Ruhrmann and Milde, 2006).

Our initial hypothesis that the social embedding of new knowledge and technologies would follow the same pattern has proven to be too simple. Of the three debates analyzed here, only one ("Dolly") comes close to the pattern we expected. Even there we can only observe the wide gap between utopian visions and dystopian opposition early on whereas the prospect of cloning humans does not become accepted and "normalized." However, the door is left open to the cloning of embryos for medical purposes. Two reasons are likely to be responsible for the seemingly divergent patterns. One is the research design itself. The debates we observed as they appeared in the media analysis were probably at different stages of their development. In other words, it is necessary to extend the time period considerably if one wants to capture the entire process of "embedding" of new knowledge as we defined it above. None of the debates, cloning, stem cell research and even the HGP, can be considered "closed" at this time. As new applications are developed, discussions about their acceptability will surely flare up again. The second, obvious reason is the different nature of the technologies and their impact on dominant values. The HGP has raised much less opposition than stem cell research and cloning, and opposition to the latter is stronger and more unanimous than against stem cell research. In the

case of Germany where the debate on and opposition to stem cell research was more intense than in the UK, this may be explained partly with the "spectre of eugenics" already mentioned above, and partly with the different legal context ("law to protect embryos").

However, there is one obvious commonality between all three debates: in all of them the trail to ultimate realization of the technologies in question is blazed with promises of medical advances, and these are perceived as the reasons that will ultimately legitimate the breach of ethical barriers. Thus, further research will have to look at each case in more detail in order to identify the particular relationship between the new knowledge in question and the values affected by it. However, we see the advantage and the novelty of our study in the fact that we have looked comparatively at three different debates over three different types of knowledge. Such a comprehensive approach appears warranted in order to overcome the well-known limitations of case studies. Notwithstanding their differences, the issue is to not lose sight of the similarity between the cases: namely, that with the introduction of new biomedical knowledge into society, general ethical values such as the integrity of human nature are overcome by more mundane ones such as health and relief of suffering.

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Notes

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1 The term "new knowledge" implies new scientific knowledge, technical artefacts and techniques. In this context the term "debate" means "public communications of actors about themes, positions and arguments related to them as well as communications about other actors" (Gerhards and Lindgens, 1995: 1).

2 The studies of Kohring et al. (1999) and Hampel et al. (1998) show this for all of biotechnology whereas we deal with biomedicine only.

3 A longitudinal media analysis dealing with gene transfer into human cells for 1970–2001 shows the importance of health interests (Voss, 2006).

4 *Frankfurter Allgemeine Zeitung* (*FAZ*), *Süddeutsche Zeitung* (*SZ*), *Bild*, *Westdeutsche Algemeine Zeitung* (*WAZ*), *Die Welt*, *die tageszeitung* (*taz*), *Handelsblatt*, *Der Spiegel*, *Focus* and *Die Zeit*.

5 The corpus of Dolly contains all articles with reference to the cloned sheep Dolly. This is different from the articles that merely contain the keyword "cloning."

6 We concentrate on two papers—*Frankfurter Allgemeine Zeitung* (*FAZ*) and *Süddeutsche Zeitung* (*SZ*)—because of the large amount of articles dealing with stem cell research.

7 Further results of the quantitative content analysis were not included in this paper since we concentrate on the qualitative reconstruction of the debates.

8 Owing to the limited availability of electronic data banks this curve is based on the data from seven daily and weekly papers (*Frankfurter Allgemeine Zeitung* (*FAZ*), *Süddeutsche Zeitung* (*SZ*), *die tageszeitung* (*taz*), *Handelsblatt*, *Der Spiegel*, *Focus* and *Die Zeit*).

9 The birth of "Dolly" was also an important news item in the American elite press (Nisbet and Lewenstein, 2002: 373). Since then, the media places more emphasis on ethical and controversial aspects of biotechnology.

10 The HGP was omitted because sufficient data on the debate were supplied from a cooperating project. For this we thank Jürgen Gerhards.

11 The respective corpus comprises articles of all ten newspapers.

12 The respective corpus comprises articles of all ten newspapers.

13 The respective corpus comprises articles of *FAZ* and *SZ* only (see note 6).

14 Analyzing articles of *Die Zeit* and *Frankfurter Rundschau* Doring (2005) points out that the media coverage of the HGP is characterized by images of a new biological determinism.

15 A similar media trend for the American press could be identified by Nisbet and Lewenstein (2002) for the area of biotechnology (including "green" biotechnology).

16 A study of British media discourse shows similar patterns (Smart, 2003).

17 The restriction of the Dolly media coverage to the question of human cloning could be observed in other national contexts (e.g. for Australia see Petersen, 2002). Cf. remarks above on studies of cloning.

References

DFG (Deutsche Forschungsgemeinschaft) (2001) "DFG-Stellungnahme zur Forschung mit menschlichen Stammzellen: Pressekonferenz 03.05.2001 in Bonn," URL: http://www.dfg.de/aktuelles_presse/reden_stellungnahmen/download/statement_winnacker_03_05_01.pdf (accessed February 2006).

Dolata, U. (1998) "Unternehmen Gentechnik: Thesen zur sozioökonomischen Formierung der neuen Biotechnologie," in Kunst- und Ausstellungshalle der Bundesrepublik Deutschland GmbH (ed.) *Gen-Welten: Katalogbuch anläßlich der fünften Ausstellung des Gen-Welten-Projektes*, pp. 144–53. Bonn: DuMont.

Doring, M. (2005) "A Sequence of 'Factishes': the Media-Metaphorical Knowledge Dynamics Structuring the German Press Coverage of the Human Genome," *New Genetics and Society* 24(3): 317–36.

Durant, J., Hansen, A. and Bauer, M. (1996) "Public Understanding of the New Genetics," in T. Marteau and M. Richards (eds) *The Troubled Helix: Social and Psychological Implications of the New Human Genetics*, pp. 235–48. Cambridge: Cambridge University Press.

Eilders, C. (1997) *Nachrichtenfaktoren und Rezeption: Eine empirische Analyse zur Auswahl und Verarbeitung politischer Information*. Opladen: Westdeutscher Verlag.

Entman, R.M. (1993) "Framing: Toward Clarification of a Fractured Paradigm," *Journal of Communication Research* 43(4): 51–8.

Etzioni, A. (1973) *Genetic Fix: The Next Technological Revolution*. New York: Harper & Row.

Gamson, W.A. and Modigliani, A. (1989) "Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach," *American Journal of Sociology* 95(1): 1–37.

Gerhards, J. and Lindgens, M. (1995) "Diskursanalyse im Zeit- und Ländervergleich: Methodenbericht über eine systematische Inhaltsanalyse zur Erfassung des öffentlichen Diskurses über Abtreibung in den USA und der Bundesrepublik in der Zeit von 1970 bis 1994." Discussion Papers FS II 95-105. Berlin: Wissenschaftszentrum Berlin für Sozialforschung.

Gerhards, J., Neidhardt, F. and Rucht, D. (1998) *Zwischen Palaver und Diskurs: Strukturen öffentlicher Meinungsbildung am Beispiel der deutschen Diskussion zur Abtreibung.* Opladen: Westdeutscher Verlag.

Gregory, J. and Miller, S. (1998) *Science in Public: Communication, Culture, and Credibility*. New York: Plenum Press.

Hajer, M.A. (1993) "The Politics of Environmental Discourse: A Study of the Acid Rain Controversy in Great Britain and the Netherlands," Dissertation, Oxford University.

Hampel, J., Ruhrmann, G., Kohring, M. and Görke, A. (1998) "Germany," in J. Durant, M.W. Bauer and G. Gaskell (eds) *Biotechnology in the Public Sphere: A European Sourcebook*, pp. 63–76. London: Science Museum.

Handyside, A.H., Kontogianni, E.H., Hardy, K. and Winston, R.M. (1990) "Pregnancies from Biopsied Human Preimplantation Embryos Sexed by Y-specific DNA Amplification," *Nature* 344: 768–70.

Kevles, D.J. (2000) "The Ghost of Galton: Eugenics Past, Present, and Future," in M.A. Signer (ed.) *Humanity at the Limit: The Impact of the Holocaust Experience on Jews and Christians*, pp. 180–201. Bloomington: Indiana University Press.

Kohring, M. (2005) *Wissenschaftsjournalismus: Forschungsüberblick und Theorieentwurf*. Konstanz: UVK.

Kohring, M., Görke, A. and Ruhrmann, G. (1999) "Das Bild der Gentechnik in den internationalen Medien: Eine Inhaltsanalyse meinungsführender Zeitschriften," in J. Hampel and O. Renn (eds) *Gentechnik in der Öffentlichkeit: Wahrnehmung und Bewertung einer umstrittenen Technologie*, pp. 292–316. Frankfurt/M. and New York: Campus.

Kollek, R. (1998) "Klonen ist Klonen—oder nicht? Warum der erste Menschenklon nicht die Gestalt ist, an der sich die Urteilsfindung orientieren muß," in J.A. Ach, G. Brudermüller and C. Runtenberg (eds) *Hello Dolly? Über das Klonen*, pp. 19–45. Frankfurt/M.: Suhrkamp.

Markl, H. (2001) "Freiheit, Verantwortung, Menschenwürde: Warum Lebenswissenschaften mehr sind als Biologie. Berlin, 22. Juni 2001: Ansprache des Präsidenten Hubert Markl anlässlich der 52. Ordentlichen Hauptversammlung der Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V.," URL: http://www.mpg.de/pdf/reden Praesidenten/hvJuni2001Markl.pdf (accessed February 2006).

Mayring, P. (2000) *Qualitative Inhaltsanalyse*. Weinheim: Deutscher Studienverlag.

Mieth, D. (1998) "Probleme der Ethik in der Biomedizin am Beispiel der Klonierungsdebatte," in M. Kleer and C. Sölling (eds) *Herausforderung Klonen*, pp. 43–56. Paderborn: Bonifatius.

Neidhardt, F. (1993) "The Public as a Communication System," *Public Understanding of Science* 2: 339–50.

Nerlich, B. and Clarke, D.D. (2003) "Anatomy of a Media Event: How Arguments Clashed in the 2001 Human Cloning Debate," *New Genetics and Society* 22(1): 43–59.

Nerlich, B., Dingwall, R. and Clarke, D.D. (2002) "The Book of Life: How the Completion of the Human Genome Project was Revealed to the Public," *health* 6(4): 445–69.

Nisbet, M.C. and Lewenstein, B.V. (2002) "Biotechnology and the American Media: The Policy Process and the Elite Press, 1970 to 1999," *Science Communication* 23(4): 359–91.

Petersen, A. (2002) "Replicating our Bodies, Losing our Selves: News Media Portrayals of Human Cloning in the Wake of Dolly," *Body & Society* 8(4): 71–90.

Rorvik, D.M. (1978) *In his Image: The Cloning of a Man*. Philadelphia: H. Hamilton.

Ruhrmann, G. and Milde, J. (2006) "From the Scientific to the Political Benefit Controversy? Molecular Medicine in German TV-News 1995–2004," Unpublished manuscript.

Smart, A. (2003) "Reporting the Dawn of the Post-genomic Era: Who Wants to Live Forever?," *Sociology of Health and Illness* 25(1): 22–49.

Staab, J.F. (1990) *Nachrichtenwerttheorie: Formale Struktur und empirischer Gehalt*. Freiburg and München: Alber.

Tambor, E.S., Bernhardt, B.A., Rodgers, J., Holtzman, N.A. and Geller, G. (2002) "Mapping the Human Genome: An Assessment of Media Coverage and Public Reaction," *Genetics in Medicine* 4(1): 31–6.

Van den Daele, W. (1985) *Mensch nach Maß? Ethische Probleme der Genmanipulation und Gentherapie*. München: Beck.

Van den Daele, W. (2000) "Die Natürlichkeit des Menschen als Kriterium und Schranke technischer Eingriffe," *WechselWirkung: Naturwissenschaft, Technik, Gesellschaft und Philosophie* 103/104(June): 24–31.

Voss, M. (2006) "Die Gentherapie im Spiegel der Presse von 1970 bis 2001," Dissertation, Bielefeld University (forthcoming).

Weingart, P., Engels, A. and Pansegrau, P. (2002) *Von der Hypothese zur Katastrophe: Der anthropogene Klimawandel im Diskurs zwischen Wissenschaft, Politik und Massenmedien*. Opladen: Leske & Budrich.

Weßler, H. (1999) *Öffentlichkeit als Prozeß: Deutungsstrukturen und Deutungswandel in der deutschen Drogenberichterstattung*. Opladen and Wiesbaden: Westdeutscher Verlag.

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